Refined Sugar: Impact on Health

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1. SUMMARY

Refined sugar a sugar that has been extracted from natural sources such as sugar cane, sugar beets, corn etc. it is primarily composed of sucrose and found in various forms such as granulated sugar, corn syrup. It may originate from natural sources but during refining process remove nutrients and leave only sugar. It is often use in food to enhance flavour. The recent years it is found that the over consumptions cause various health problems such as obesity, diabetes, blood pressure, aging etc. if you trying to eat healthy you do not go to day without sugar. Avoiding sugar is most difficult because it is found in most food. You may minimise the use of refined sugar. Any sugar that is naturally occurring in food are safe to eat. The natural sugar food material is enriched with nutrients along with sugar. Any sugar contains in naturally occurring food gets green light. Foods with added sugar gets yellow light and get red light food contain a lot of processed sugar. The consumption of natural sugar is a positive impact on health.

Keywords: Refined sugar, Natural sugar, Sucrose, Health

2. INTRODUCTION

Sugar is one of the simplest groups of carbohydrates known as monosaccharides general formula $C_6H_{12}O_6$, consisting of several sweet, colourless, water-soluble molecules found in seed plant sap and mammalian milk. The most prevalent sugar is sucrose; a crystalline tabletop and industrial sweetener found in meals and beverages. Sucrose also known as table sugar, is a disaccharide in nature represent by the general formula $C_n(H_2O)n\text{-}1$. It is also known as double sugar represent by $C_{12}H_{22}O_{11}$, that is include one molecule of glucose linked with one molecule of fructose via one molecule of H_2O molecule which is lost during condensation.

$$\underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6} \longrightarrow \underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + \underset{\text{water}}{H_2O}$$

Refined sugar or white sugar is almost pure sucrose, that is when take in body hydrolysed in to simple sugar, glucose and fructose. Sucrose is mainly obtained from sugar cane (*Saccharum officinarum*) and sugar beet (*Beta vulgaris*). It is naturally produced from plant and play important role in cooking, backing, adding sweetness and texture to dishes.

Sugar Cane

Sugar beet

Refined sugar has no nutritional value and poses health risks. Only energy is contained in it; 387 calories are found in 100g of refined sugar. Consuming sugar can lead to a number of illnesses, including cancer and diabetes[1].

3. SUBJECT MATTER

Regularly consuming high amount of refined sugar can impact serious effect on your health. It can cause rapid spike and drop blood glucose level. Lead to weight gain, increase triglyceride level. It can affect mental health and energy level.

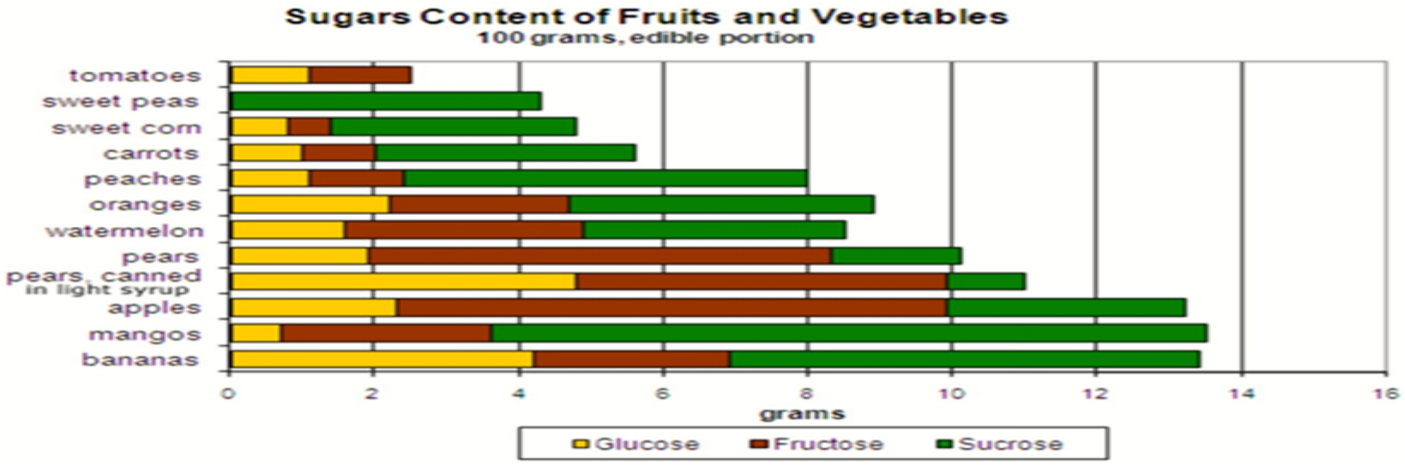
3.1 Sources of Sugar:

There is various source of refined sugar, these are fruits, vegetables, grains, dairy products etc.

Fruits Sources: Almost every fruit contains some form of sugar. The primary natural sugar found in fruits is fructose along with sucrose. Berries, bananas, oranges, apples, and so on are a few examples.

Vegetable source: Natural sugars are also present in some vegetables, like beets and carrots, but in smaller quantities than in fruits.

Dairy Product Sources: Another natural sugar is lactose, which is found in milk and yogurt. This covers goods like ice cream and cheese.



All vegetables or fruits contain mixture of simple sugar such as sucrose, glucose, fructose. The John Yudkin was first person suggest in 1972 sugar was a problem in their wrote book "*Pure, White and Deadly*". He was the first to propose that the primary cause of diabetes, obesity, and coronary heart disease was the use of "processed sugars". The nutrition industry at the time, which was centred on low fat and fibre, discredited his study[1,2].

3.2 Varieties of Sugar

In Indian homes, white sugar is frequently used. It provides a sweet taste and a clean white appear because of its high level of purification and treatment. It is mostly used in tea, coffee, and baking and cooking.

Essential Characteristic:

- It is refined pure sugar.
- It has high glycaemic index valve.

White Sugar

It's mainly made from palm or sugarcane, jaggery is an unrefined sugar. Although it undergoes fewer steps of processing, it retains more nutrients. In Indian sweets, refreshments, and traditional food styles, jaggery is commonly used.

Essential Characteristic:

- It is rich in minerals as will as iron.
- Its often used in sweets.

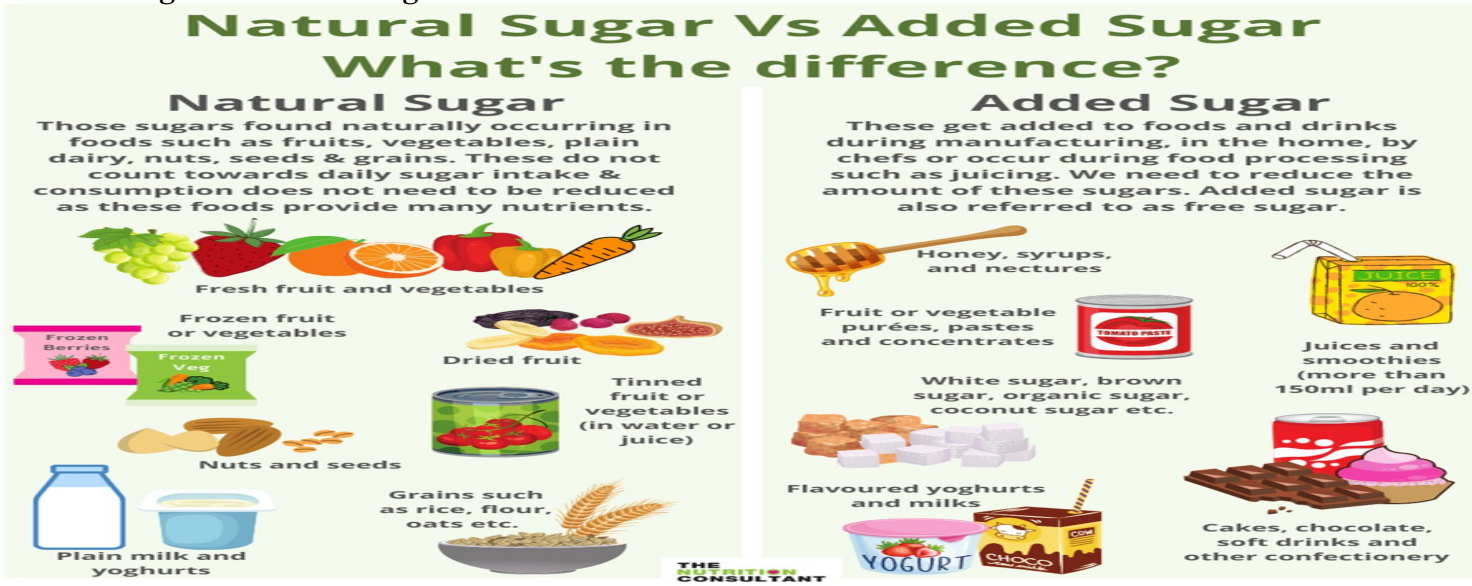
Jaggery (Gur)

 **Brown Sugar**	Brown sugar offers a damp texture and an earthy caramel flavour because it still contains some molasses. It is used in baking and cooking and is less processed than white sugar. Essential Characteristic: ♦ It includes molasses with unique flavour. ♦ It has a good alternative for various recipes and flavours.
 **Khandsari Sugar (Khand)**	The khand sugar, a traditional raw sugar, are used frequently in desserts and sweets. It is less processed and contains the sugarcane juice's nutrients. Essential Characteristic: ♦ Its coarse texture with large crystals. ♦ Its often used in Indian food recipes.
 **Rock Sugar (Mishri)**	The rock sugar is a crystalized form of sugar that is commonly used Indian kitchen. It is prepared by processing and evaporating sugarcane juice until it converts in solid crystals. Essential Characteristic: ♦ It's a form of crystalized sugarcane juice. ♦ It's mostly used to ayurveda preparation for digestive benefits.

3.3 Comparison of different sugar

Sugar Type	Health benefits	Common use
White sugar	Excessive glycemic index and no calories.	Mostly used in sweetening the beverages, Desserts and baking.
Jaggery	Higher valve of Iron, Minerals and digestive aid.	Mostly used as traditional sweet, beverages and curries.
Brown sugar	It's rich in minerals but retain molasses.	Used in sauces, desserts and baking.
Khandsari	It's a natural sugar that is less refined.	Mostly used drinking syrup, tea and cooking.
Rock sugar	It's a alkaline forming digestive aid.	Used in various ayurveda preparation, mouth fresheners in restaurant.

3.4 Added sugar vs Natural sugar



3.5 Nutrient profile of cane sugar

A major source of empty calories, cane sugar is lacking in essential nutrients and may increase blood sugar levels. Furthermore, it increases the risk of obesity, cavities, heart disease, and fatty liver. It is important to keep in mind that there are both refined and unrefined forms of cane sugar. Like white sugar, refined cane sugar is sucrose and is considered as nutritionally empty due to its lacking minerals[3-6].

On the other hand, less processed foods like khaand, jaggery, or raw cane sugar include trace minerals like calcium, magnesium, and iron. However, unless they are consumed in extremely unsafe amounts, their health benefits are still limited. Making sensible decisions about nutrition therefore requires a knowledge of the differences between sugar varieties.

The nutrient profile can be more accurately determined by the degree of processing that is done to the cane sugar. According to Dr. Selvi, there are approximately regarding the following minerals in 100 grams of jaggery and khaand:

- Cu about 0.1 to 0.3 mg
- Zn about 0.2 to 0.4 mg
- Fe about 11 to 13 mg
- P about 20 to 90 mg
- Ca about 40 to 100 mg
- Mg about 70 to 90 mg
- K about 100 to 1000 mg

Iron, potassium, and magnesium are just some of the minerals that can be found in raw or unrefined cane sugars like jaggery or khaand, but you shouldn't consume excessive amounts of them if you want to get a lot of minerals. Although they are not a nutritious food, they are slightly better to refined sugar. Because of this, it's simply less of the worst; watch the amount you use[5,6].

3.6 Sugar statistic- India

Production Volume: For the 2024–25 sugar season (October–September), the Food Ministry predicts that 33 million metric tons (MMT) of sugar will be produced, which will be enough to cover the entire nation's annual need.

Consumption: Due in large part to the lack of important occurrences like the 2024 General Elections, India is expected to use 28 million tons of sugar in the 2024–25 sugar year, a decline of about 1.5 million tons from the previous year.

Recent Trends: India manufactured 9.54 million metric tons of sugar in January 2025, a 15.5% drop from the previous year. The main causes of the drop include unfavorable weather conditions and crop diseases, which contributed to lower cane yields in major agricultural areas like Maharashtra, Karnataka, and Uttar Pradesh[7].

3.7 Sugar statistic- Global

Production Volume: The expected global sugar production for 2024–2025 is 186.6 MMT, that is increases 2.8 million tons from the previous year. Lower production in Brazil is more than offset by higher volumes production in China, India, and Thailand.

Consumption Trends: With expanding in nations like India, it is predicted that global sugar consumption will reach a new high[7].

3.8 Advantage and disadvantage of sugar

3.8.1 Advantage of sugar

Immediate energy sources

Rapid Energy Boost: The body uses sugar, especially glucose, as a rapid energy source. Sugar is quickly absorbed into the bloodstream after consumption, giving rise to an instant energy boost. This can be especially beneficial for athletes or those who need to recover quickly from intensive physical activity.

Brain Function: Glucose is the main energy source for the brain. Sufficient glucose levels are essential for mental functions such as memory, focus, and basic brain function. Sugar consumption can significantly improve alertness and cognitive function.

Enhance enjoyment and flavour

Improved Taste: Foods and drinks taste significantly improved when sugar is added. It makes food more appetizing and pleasant by regulating acidity and bitterness. This can be especially important when preparing appetizing and nourishing meals, especially for kids and people with weaker appetites.

Culinary Versatility: Sugar is essential for texture, colour, and preservation in baking and cooking. By preventing microbial development, it helps preserve jams and jellies, gives baked goods a pleasing texture, and aids in the browning of baked goods[8,9].

Facilitate food preservation -In many foods, sugar serves as a preservative. High sugar content can prolong the shelf life of goods like sweetened preserves and canned fruits by inhibiting the formation of mould and bacteria. Food waste can be reduced and food items' shelf life can be increased due to this preservation effect.

Physiological and social valve -Mood Enhancement: Eating sugary foods can cause the brain's endorphins and serotonin, which are feel-good and mood-enhancing chemicals, to be produced. This can promote a feeling of wellbeing and provide momentary stress relief.

Cultural and Social Aspects: Sugar is important in many various cultural and social settings. Sweet food and desserts are essential to social interaction and group experiences during many traditional holidays and celebrations[8,10].

Nutritional supplemental valve -In order to make nutritional supplements and medications appealing to both adults and children, sugar is occasionally added to them. This might be very important for making sure that dietary supplements and therapies are taken as advised[11].

3.8.2 Disadvantage of sugar

Health risks and chronic disease

Obesity: Excessive sugar consumption is strongly linked to obesity. Consuming an excessive amount of sugar raises calorie intake, leading to weight gain. In turn, obesity is linked to a host of health issues, such as diabetes, heart disease, and several types of cancer.

Diabetes mellitus: One of the primary risk factors for type 2 diabetes is a diet heavy in sugar, especially added sugars and sugary drinks. Frequently eating excessive quantities of sugar can cause insulin resistance, which lowers the body's cells' sensitivity to insulin and raises blood sugar levels.

Cardiovascular Disease: Consuming a lot of sugar has been linked to a higher risk of cardiovascular disease. Consuming too much sugar raises blood pressure, lipid levels, and inflammation—all of which are heart disease risk factors[8-11].

Dental Health Problem

Tooth Decay: Dental caries, or tooth decay, is primarily caused by sugar. Sugar is consumed by oral bacteria, which then produce acids that break down tooth enamel and cause cavities. The risk of dental problems is increased when poor tooth hygiene and an excessive amount of sugar are coupled.

Gum Disease: Continually consuming sugar-filled foods and beverages might aggravate gum disease. Gum and tooth damage can result from gingivitis and periodontitis, which are caused by bacteria that flourish in a high-sugar environment.

Effect on metabolic health

Insulin Resistance: Insulin resistance is a result of insulin action being interfered with by excessive sugar consumption. This disorder makes it more challenging for the body to properly control blood sugar levels, which elevates the risk of type 2 diabetes and contributes to metabolic syndrome[9-13].

Non-Alcoholic Fatty Liver Disease (NAFLD): Non-alcoholic fatty liver disease is linked with high fructose and other sugar intake. The liver breaks down fructose, which can lead to inflammation, fat accumulation, and liver damage.

Addictive potential-Sugar Cravings: Sugar's addictive qualities can cause overindulgence and cravings. Sugar's pleasurable effects can lead to a vicious cycle of dependency, making it difficult for people to cut back or regulate their use.

Behavioural Problems: According to certain research, consuming too much sugar may be linked to behavioural disorders like mood swings, impatience, and a loss of self-control. This may have an effect on general wellbeing and mental health[8,9].

Nutrient deficiency -Empty Calories: Foods with a lot of added sugar frequently produce "empty calories," which are energy-boosting foods devoid of vital nutrients. Because sugary foods frequently replace more nutrient-dense options in the diet, relying on them can result in dietary shortages.

Impaired Nutrient Absorption: Consuming a lot of sugar might make it more difficult for the body to absorb vital nutrients. The body's capacity to absorb nutrients from other foods may be hindered by too much sugar, which could result in vitamin and mineral shortages[8-13].

Factor in Inflammation -Consuming a lot of sugar has been associated with increased inflammation in the body, which can lead to a number of health problems, including arthritis, cardiovascular disease, and other inflammatory illnesses. Consuming too much sugar might cause an inflammatory response that can be detrimental to one's general health and

May accelerate the skin aging process-A diet heavy in sugar and processed carbohydrates causes the body to produce AGEs, which can cause premature aging of the skin[11-13].

Sugar and cancer -The scientific data about sugar consumption and cancer has been examined by specialists affiliated with World Cancer Research Fund International3. Although the evidence was characterized as limited and contradictory,

this report raised the possibility of an elevated risk of colorectal cancer in areas with high consumption of foods high in sugar3,4. The Carbohydrates and Health Report of the Scientific Advisory Committee on Nutrition in 2015 found no correlation between the incidence of colorectal cancer and the consumption of sugar-sweetened beverages, but it did conclude that there was insufficient evidence to draw conclusions about the relationship between sugar intake and colorectal cancer [14-16].

Sugar depresses immune system -According to a 1973 Loma Linda University study, sugar consumption alters white blood cells that fight bacteria for at least five hours after consumption. On the job, the immune cells were slow. Have you ever observed your children become ill.

According to more recent research from 2018, insulin resistance, which ultimately impairs the immune system, is the mechanism by which sugar damages the immune system [17-19].

4. OBJECTIVE OF STUDY -Knowing sugar's benefits and drawbacks highlights how crucial moderation and balanced consumption are. Although sugar provides benefits like instant energy and enhanced flavour, consuming too much of it can have serious negative health effects. In order to keep a healthy diet, you must:

Moderate Intake: Restrict your intake of sugar-filled foods and drinks. Choose natural sweeteners, including fruits, which offer both natural sugars and vital elements.

Examine the labels: Be mindful of hidden sugars in processed foods and pay attention to food labels. Making healthier food choices and controlling total sugar intake can be aided by this.

Give Whole Foods Priority: A diet high in complete, unprocessed foods should be the main focus. To guarantee a balanced nutrient intake, include a range of fruits, vegetables, entire grains, and lean proteins.

Educate on Health Effects: Educate yourself and other people on the possible negative health effects of consuming too much sugar. Improving awareness can help people make healthier food choices and improve their general health and wellbeing.

5. CONCLUSION—Sugar plays a complicated role in our diets, with both advantages and disadvantages. Although sugar provides flavour, provides you quick energy, and is used in traditions and food preservation, too much of it may result in serious health issues like obesity, diabetes, and heart disease. To maintain optimum wellness, it is essential to find a balance between minimizing the hazards related to sugar and enjoying its health advantages. Humans can minimize the potential harmful effects of sugar while still enjoying its benefits by making educated decisions and limiting their intake.

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